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Title : Feeding method does affect otolith digestion: Experiments with captive grey seals

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Abstract : Investigating pinniped diet is important, both to determine the role of pinnipeds in marine ecosystems and to quantify pinniped-fishery interactions. Scat analysis has become widely used for assessing diet composition of free-ranging seals because it is unobtrusive and gives quantitative estimates. Captive feeding experiments play a crucial role in scat analysis but methodology has varied. In some experiments a range of target prey species has been fed whole; in others a carrier species has been used to present otoliths of different species. We investigated whether these different methods of feeding otoliths to two captive grey seals affected the amount of otolith digestion and therefore our ability to estimate fish size accurately.

Recovery rates varied between the three prey species (haddock, plaice and sandeels) but were not affected by feeding method. However, otoliths of all three species were more digested in the carrier experiments; resulting digestion coefficients were greater than those from target experiments. Original fish length was accurately predicted by applying species-specific target digestion coefficients to partially digested otolith size and then linear otolith size-fish length relationships (no significant difference between actual and estimated fish length; $p>0.05$). Use of grade-specific target digestion coefficients improved the precision of fish length estimates (coefficients of variation were reduced by up to 18%). Fish lengths could not be accurately estimated using carrier digestion coefficients ($p<0.05$). Fish weights were predicted from fish lengths using non-linear relationships. The proportion of target to carrier mean fish weight varied significantly between species (haddock 1.302; plaice 0.614; sandeels 0.463).

Removal of otoliths from the skull case does affect their digestion by seals. Furthermore, use of carrier digestion coefficients affects prey species differently, which could have a potentially large effect on estimates of diet consumption. Targets should be used to present otoliths to seals in all future captive feeding experiments.